Price Indices for Estimating Cattle Prices in the Pacific Northwest

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Introduction

THE HISTORY of the cattle industry since statistics were first collected in 1865 has been cyclical. Cattle cycles are the result of cow-calf producers expanding inventories in response to profits and contracting their herd size in response to losses. No two cycles have ever been entirely alike, but they have some common features. There are four components to consider when discussing the cattle price cycle: "secular" or long-term trends, cyclic periods measured from low to low in prices or numbers, seasonal or month-to-month changes, and irregular or unpredictable changes.

This publication describes trends in cattle prices and explains the use of seasonal price indices to estimate future cattle prices. Although the indices contain some variability and unpredictable changes within the market can occur, the indices allow producers to estimate prices for potential sale months, which can be an aid in budget planning.

Cycles, Trends, and Changes

Long-term trends

A secular trend is one of long duration (usually at least 10 years) and possibly indefinite duration. These increasing or decreasing trends have lasted for several cattle cycles. From the end of the Civil War until the late 1920s, there were three cycles on a gradually increasing trend line. From the late 1920s until the mid-1970s, this trend increased more rapidly. Since the 1975 peak in inventory numbers, the long-term trend has been toward lower numbers of cattle (figure 1). Higher productivity (as in heavier carcass weights) have compensated for lower numbers (figure 2).

Cyclic periods

Individual cycles are most typically measured from low to low in cattle numbers. There were four cycles from 1938–79: 1938–49, 1949–58, 1958–67, and 1967–79. In
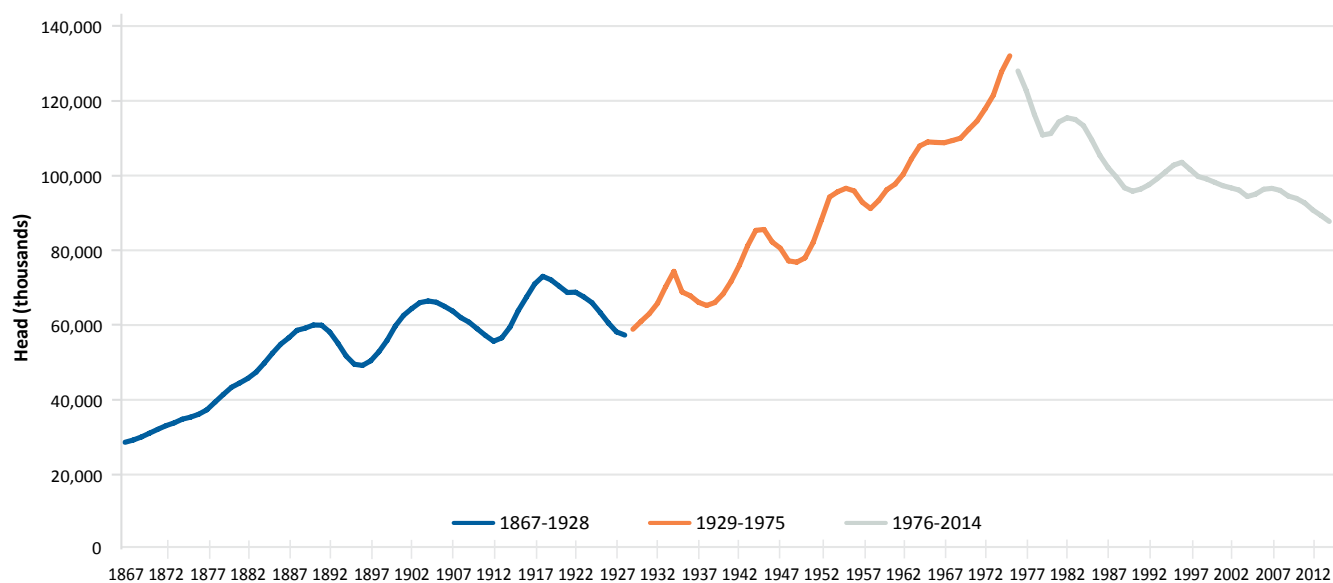

Figure 1. Long-term trend in U.S. cattle numbers, 1867–2014. Source: USDA and Livestock Marketing Information Center.

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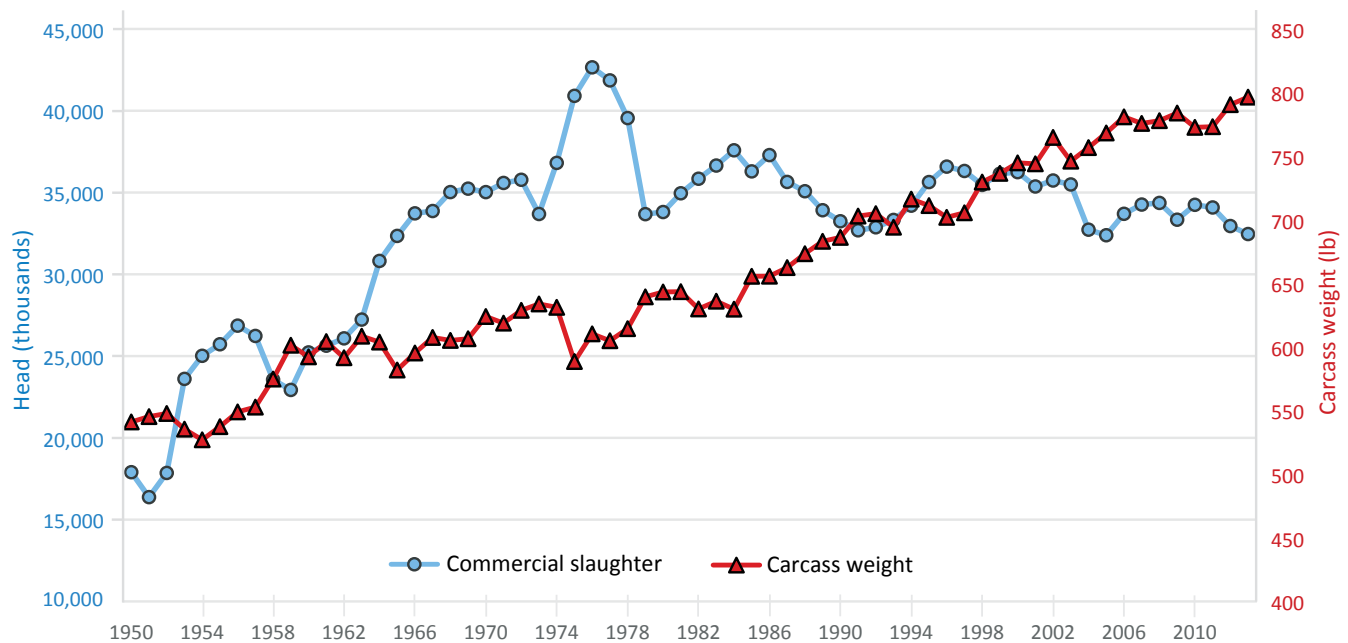
Figure 2. Annual U.S. cattle slaughter numbers and carcass weights, 1950–2013. Source: USDA and Livestock Marketing Information Center.

the 1967–79 cycle, cattle numbers reached an all-time high of 132 million head in 1975.

Seasonal patterns

Seasonal price movements are a reflection of marketing activities by cattlemen during a marketing year. Most cattle producers are on similar calving and weaning schedules within geographic regions and because of this, calves of similar weights tend to be "bunched," or marketed, in the same time frame. Prices may decline as marketings increase, and then prices may increase as the supply of calves becomes scarce. Additionally, seasonal price patterns differ based upon the class or weight of cattle marketed. Seasonal price patterns in the Pacific Northwest for cull cows and bulls and five different weights of feeder and stocker steers and heifers appear in the appendix.

Irregular changes

Irregular changes in the cattle market are the result of outside forces that can disrupt normal market behavior. Two examples of the impact on prices of irregular changes are the 2003 detection of a cow with bovine spongiform encephalopathy (BSE, a.k.a. mad cow disease) and the severe drought of 2011. Usually these events arrive without much warning but must be dealt with using good management to avoid undue harm to the business.

Price Indices

Seasonal price patterns can be easily described by a monthly index that summarizes monthly historical prices for a specific class and weight of cattle. Each monthly index is given in relation to the annual average for that price class. Therefore, a monthly index of 1.00 (100%) means that month is equal to the annual average. An index of 0.95 (95%) means prices in that month average 5% below the annual average. The indices in the appendix were calculated using a 12-month centered moving average. This method diminishes cyclical and trend factors from the resulting index.

Why have a separate index for the Pacific Northwest instead of using an index for the U.S.? The seasonal patterns here versus other areas differ due to various conditions that impact calving and weaning. Relative to the southern plains, prices in the Pacific Northwest tend to be higher in the spring and lower in the fall (figure 3). This could provide opportunity for operators who can utilize the difference in seasonality between markets to their advantage.

Variation in the price indices, and therefore in prices, will occur. Each index in the appendix is shown along with its standard deviation, an indicator of the variability of the index. Based on the price series used to calculate the index, prices would be expected to lie between plus or minus one standard deviation two-thirds of the time. When the standard deviation is narrow, the index is more reliable (less risky) than when the range is wider. Maximum and minimum indices for each month may also indicate variability.
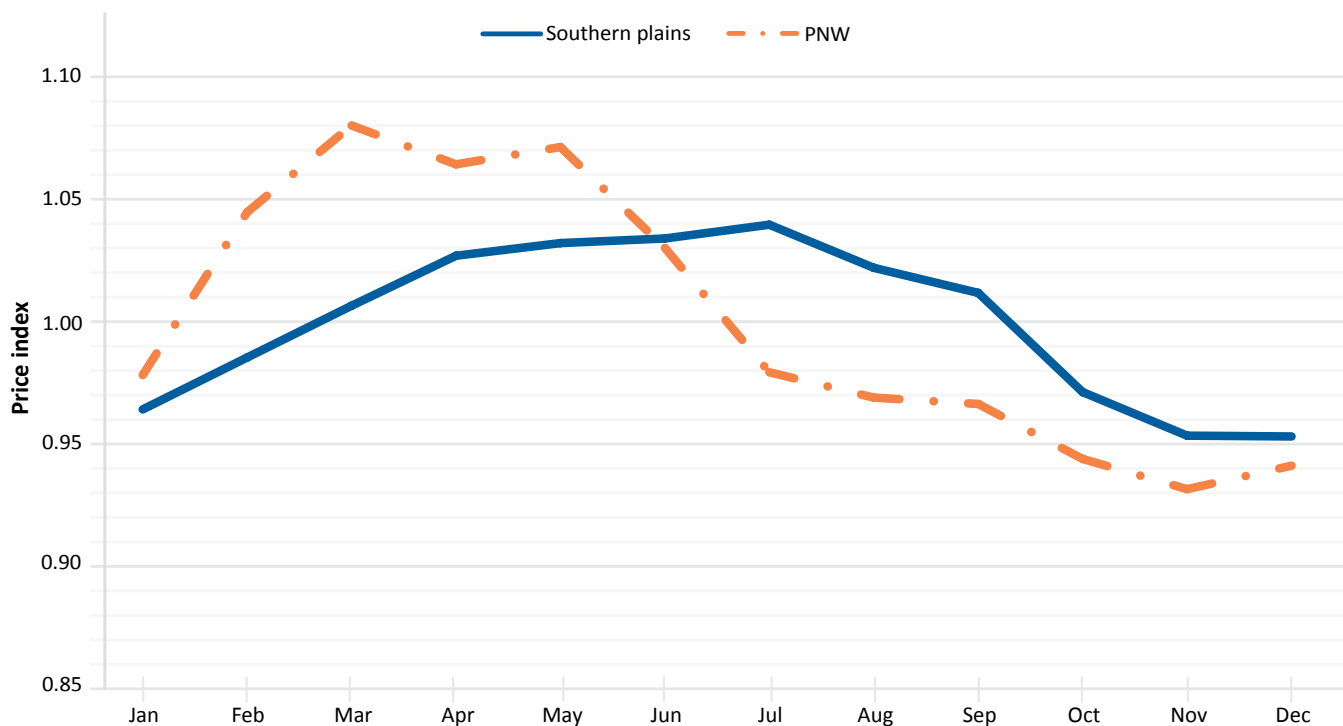
Figure 3. Average seasonal price index for 500- to 600-pound steers in the Pacific Northwest and in the southern plains (2001–2011). Source: USDA and Livestock Marketing Information Center.

Using Price Indices to Project Prices

Price indices can be used to project prices for budget and planning purposes. This is accomplished by using the index to project a price for some later month based on the current price. In addition, the range of variation (+/- one standard deviation) should be calculated to determine the likely price range of the cattle.

For example, suppose a producer normally markets 550-pound steers in November and the March 2014 average price for that weight calf is $198.51 per hundredweight (cwt). The ratio of the November and March indices should equal the ratio of the November and March prices.

$$\frac{\text{November Price}}{\text{March Price}} = \frac{\text{November Index}}{\text{March Index}}$$

You can use this relationship and the indices in figure A5 to project the price for November as:

$$\text{Estimated November Price} = \frac{\text{November Index x March Price}}{\text{March Index}}$$

$$\text{Estimated November Price} = \frac{0.925 \text{ x } \$198.51}{1.11} = \$164.17$$

A range of estimated prices can also be projected by using the standard deviations above and below the estimated price. These are calculated in the same way as the price but using the index numbers for plus one and minus one standard deviations. Using the variance to "bracket" the projection gives a range where one would expect the price to be 67% of the time.

$$\text{November +/- STD Price} = \frac{\text{November +/- STD Index x March Price}}{\text{March +/- STD Index}}$$

$$\text{Highest Estimated Price} = \frac{0.952 \text{ x } \$198.51}{1.138} = \$166.07$$

$$\text{Lowest Estimated Price} = \frac{0.898 \text{ x } \$198.51}{1.099} = \$162.21$$

The implication here is that a price of $164.17 is probable, but the actual price should likely fall within about a $4 range ($166.07 to $162.21) two-thirds of the time.

Using the maximum and minimum indices for a projected month may give more indication of the absolute variation in the potential price. Little variability in the projected price range indicates a more reliable monthly index factor. If a wide price range results, it may be partly due to the fact that a majority of calves in that particular weight class are marketed during one time period, typically the fall. It may also indicate that prices were highly variable over the period used to develop the indices. One reason for a wide range of price fluctuations is fewer calves are marketed between April

and August, so reported prices are limited in that time period.

Rather than calculate the estimated price once, at budget time, price projections should be updated at least once a month during the year and more frequently as marketing time approaches. This will allow projections using more current prices and should improve the accuracy of the estimate.

Counter-seasonal price moves occur when prices move opposite to what is ordinarily expected or historically observed. For example, in 2013 the March price for 500- to 600-pound feeders was $155.60 per cwt. Using the formula above, the estimated November price in March was $128.68 per cwt, but the actual average November price was $163.42 per cwt. This $34 difference per cwt was in part due to a very short supply of cattle and continued strength of domestic demand and beef exports.

Herd Management Decisions

Individual operators need to make annual budgets and financial arrangements for operating capital and other operational needs. An inherent part of this process is a projection of calf and cattle prices for the marketing season, which is typically several months beyond when initial planning occurs. Factors that must be considered include herd size expansion or contraction, costs and availability of feedstuffs, and market alternatives. Historical trends are important too; during periods of herd building and higher prices, cow-calf operations have traditionally been more profitable than stocker operations.

Alternative marketing options include selling weaned calves, wintering calves for sale in the spring, wintering calves and pasturing to sell in the fall, and retaining ownership to slaughter. Shifting from a straight weaned-calf sale program to calf wintering may enable the operation to reduce or eliminate losses during the liquidation phase of the cattle cycle. Tax consequences of switching from one method to another may be a limiting factor and should be considered during the decision making process. Careful financial evaluation and planning should precede any major changes to the operation.

Appendix. Seasonal price indices for the Pacific Northwest
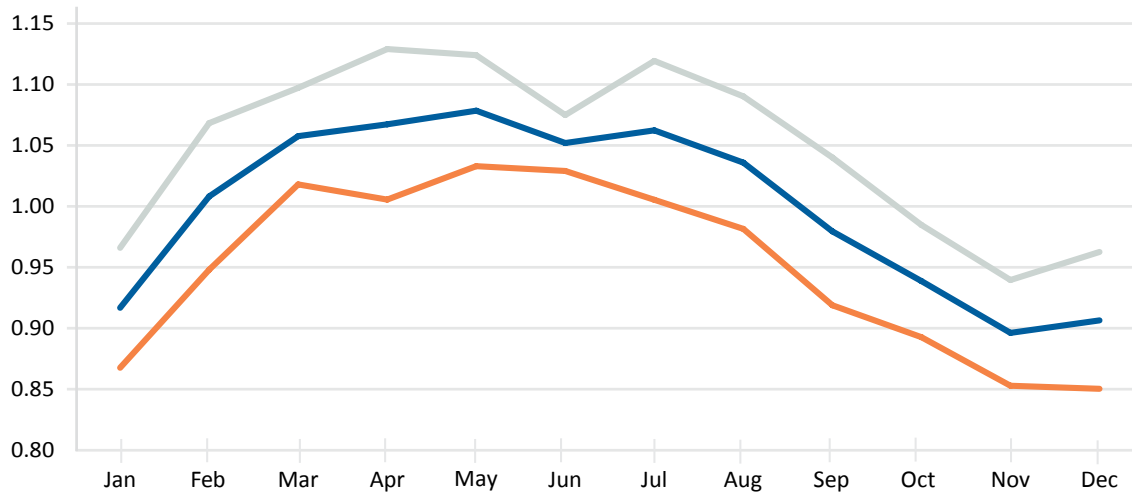
Utility slaughter cows

Figure A1. Seasonal price indices for utility slaughter cows in the Pacific Northwest, 2008–12.

Table A1. Seasonal price indices for utility slaughter cows in the Pacific Northwest, 2008–12.

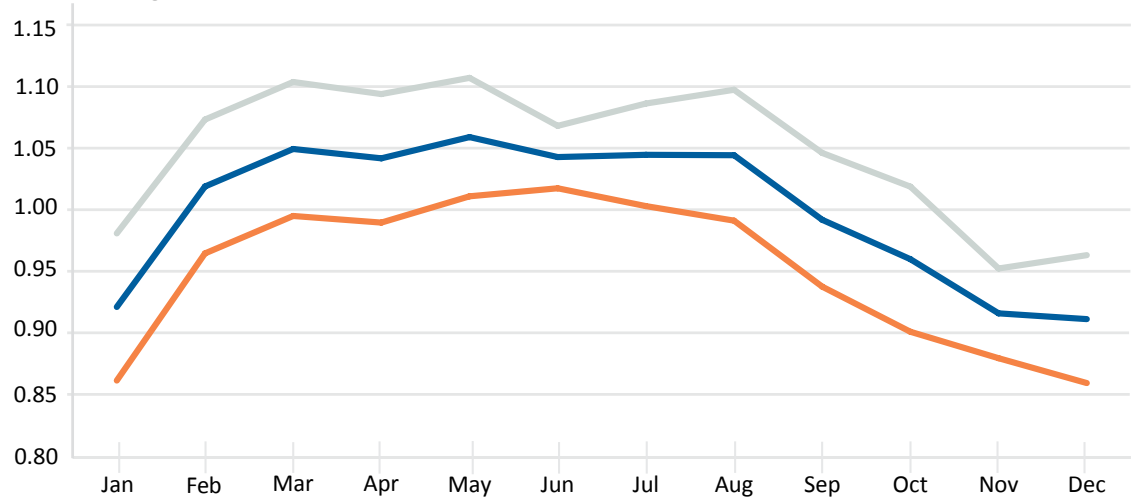|	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	0.917	1.008	1.058	1.067	1.079	1.052	1.062	1.036	0.980	0.939	0.896	0.907
Index + 1 STD	0.966	1.068	1.097	1.129	1.124	1.075	1.119	1.090	1.040	0.985	0.940	0.963
Index − 1 STD	0.868	0.948	1.018	1.006	1.033	1.029	1.005	0.982	0.919	0.893	0.853	0.850

Cutter slaughter cows

Figure A2. Seasonal price indices for cutter slaughter cows in the Pacific Northwest, 2008–12.

Table A2. Seasonal price indices for cutter slaughter cows in the Pacific Northwest, 2008–12.

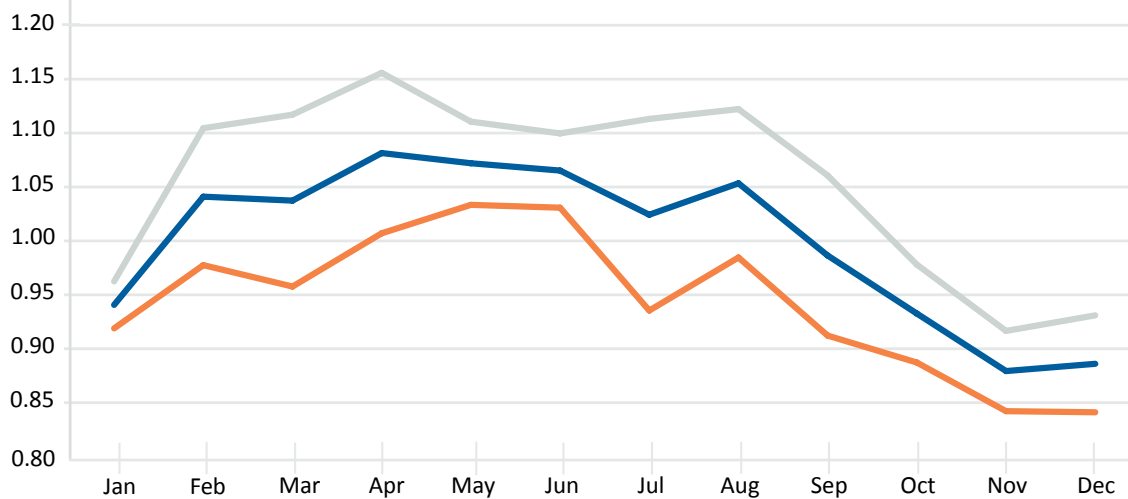|	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	0.921	1.019	1.049	1.042	1.059	1.043	1.045	1.044	0.992	0.960	0.916	0.911
Index + 1 STD	0.981	1.073	1.104	1.094	1.107	1.068	1.086	1.097	1.046	1.019	0.952	0.963
Index − 1 STD	0.861	0.965	0.995	0.990	1.011	1.017	1.003	0.991	0.937	0.901	0.879	0.859

Cull bulls

Figure A3. Seasonal price indices for cull bulls in the Pacific Northwest, yield grade 1–2, 2008–12.

Table A3. Seasonal price indices for cull bulls in the Pacific Northwest, yield grade 1–2, 2008–12.

	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	0.941	1.041	1.037	1.081	1.072	1.065	1.024	1.053	0.986	0.933	0.879	0.886
Index + 1 STD	0.962	1.104	1.117	1.156	1.111	1.100	1.113	1.122	1.061	0.978	0.917	0.931
Index - 1 STD	0.919	0.978	0.958	1.007	1.033	1.031	0.935	0.985	0.912	0.887	0.842	0.841

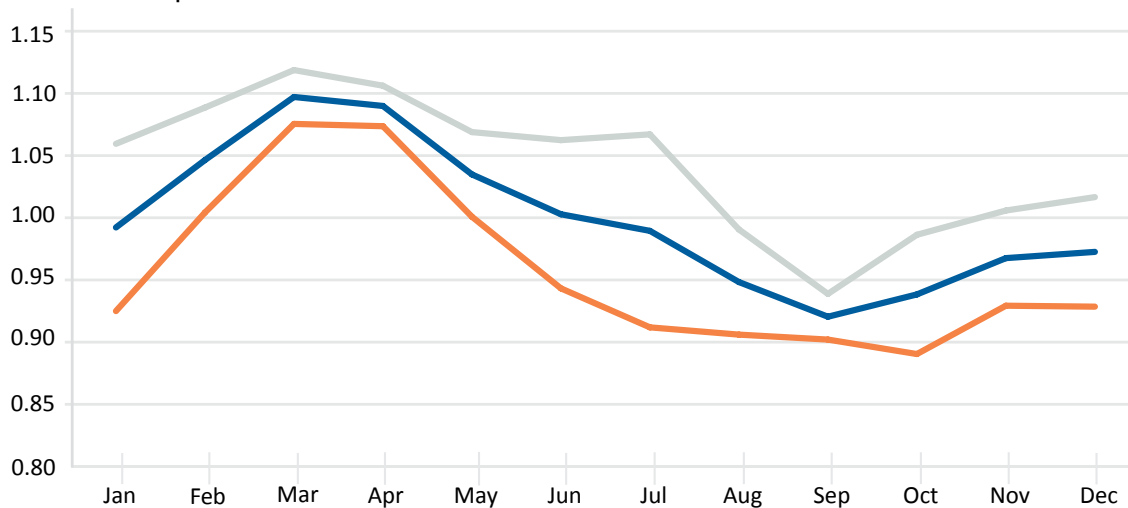## 400- to 500-pound feeder steers

Figure A4. Seasonal price indices for 400- to 500-pound feeder steers in the Pacific Northwest, 2008–12.

Table A4. Seasonal price indices for 400- to 500-pound feeder steers in the Pacific Northwest, 2008–12.

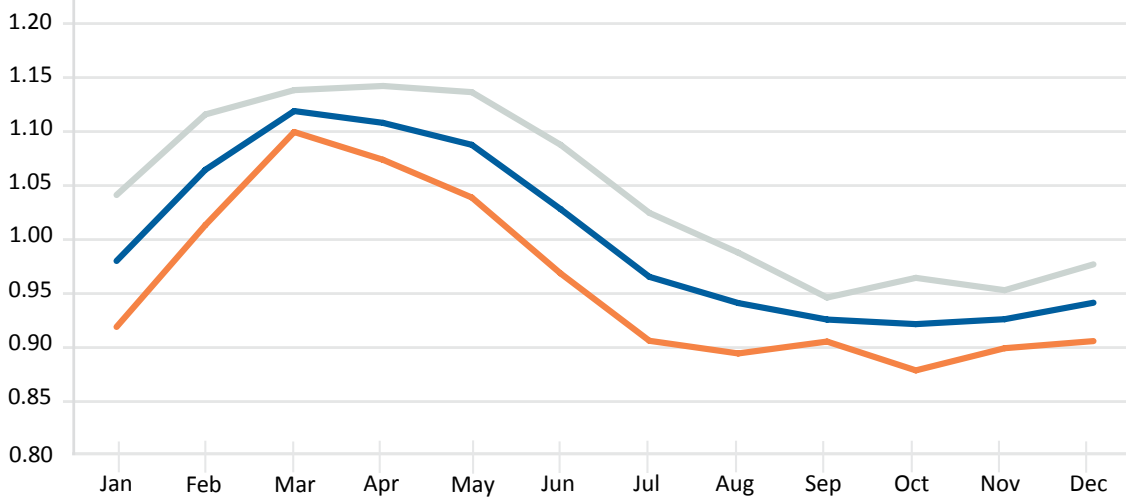|	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	0.992	1.046	1.097	1.090	1.035	1.003	0.989	0.948	0.920	0.938	0.968	0.973
Index + 1 STD	1.059	1.089	1.119	1.106	1.069	1.062	1.067	0.991	0.939	0.986	1.006	1.017
Index - 1 STD	0.925	1.004	1.075	1.074	1.001	0.943	0.912	0.906	0.902	0.890	0.929	0.929

500- to 600-pound feeder steers

Figure A5. Seasonal price indices for 500- to 600-pound feeder steers in the Pacific Northwest, 2008–12.

Table A5. Seasonal price indices for 500- to 600-pound feeder steers in the Pacific Northwest, 2008–12.

	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	0.979	1.064	1.119	1.108	1.087	1.027	0.965	0.940	0.925	0.921	0.925	0.940
Index + 1 STD	1.041	1.115	1.138	1.142	1.136	1.087	1.024	0.987	0.945	0.964	0.952	0.976
Index - 1 STD	0.918	1.013	1.099	1.073	1.038	0.968	0.905	0.893	0.904	0.878	0.898	0.905

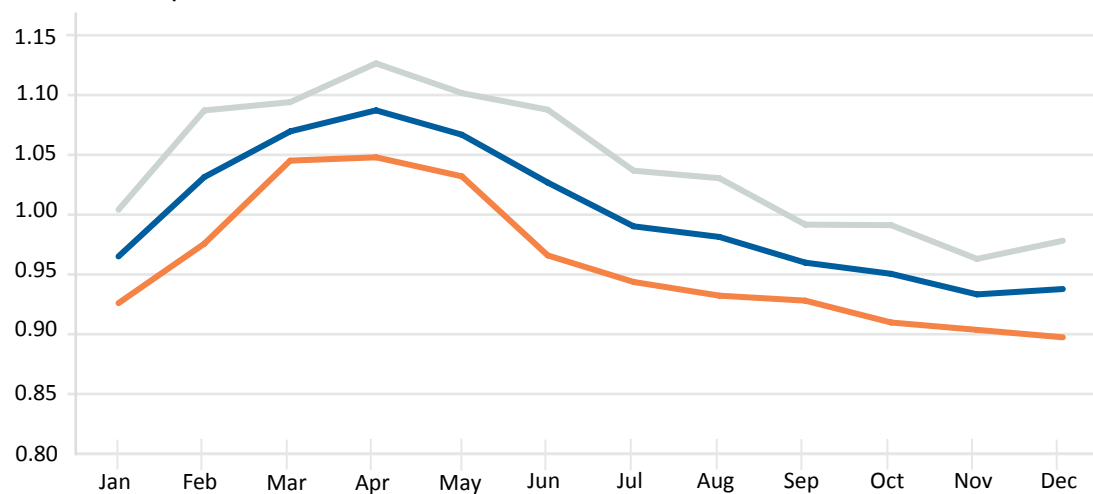## 600- to 700-pound feeder steers

Figure A6. Seasonal price indices for 600- to 700-pound feeder steers in the Pacific Northwest, 2008–12.

Table A6. Seasonal price indices for 600- to 700-pound feeder steers in the Pacific Northwest, 2008–12.

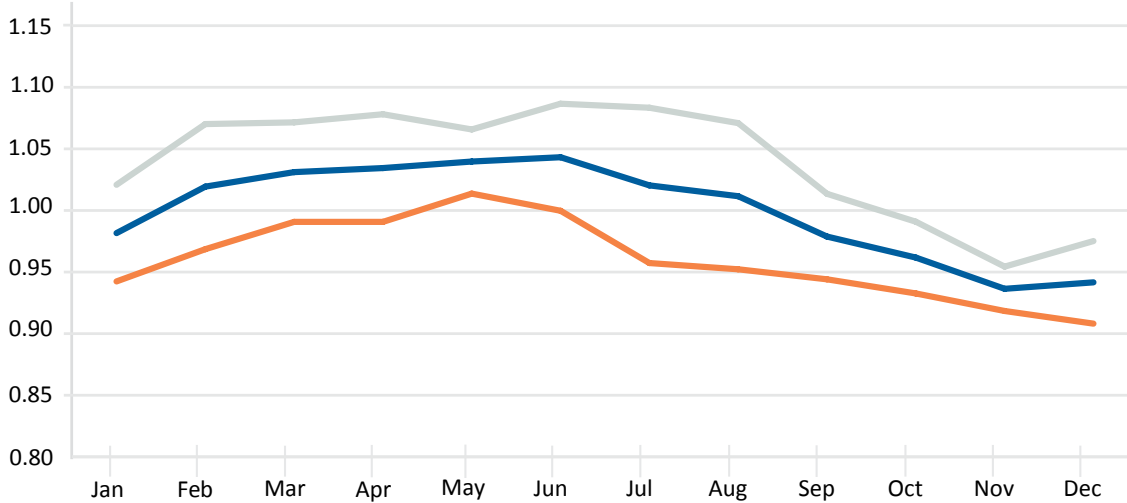|	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	0.965	1.031	1.070	1.087	1.067	1.027	0.990	0.981	0.960	0.951	0.933	0.938
Index + 1 STD	1.004	1.087	1.094	1.127	1.102	1.088	1.037	1.030	0.992	0.991	0.963	0.978
Index - 1 STD	0.926	0.976	1.045	1.048	1.032	0.966	0.944	0.932	0.928	0.910	0.904	0.897

700- to 800-pound feeder steers

Figure A7. Seasonal price indices for 700- to 800-pound feeder steers in the Pacific Northwest, 2008–12.

Table A7. Seasonal price indices for 700- to 800-pound feeder steers in the Pacific Northwest, 2008–12.

	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	0.982	1.019	1.031	1.034	1.040	1.043	1.020	1.012	0.979	0.962	0.936	0.942
Index + 1 STD	1.021	1.070	1.072	1.078	1.066	1.087	1.083	1.071	1.014	0.991	0.954	0.975
Index - 1 STD	0.942	0.969	0.991	0.991	1.014	1.000	0.957	0.952	0.944	0.933	0.918	0.908

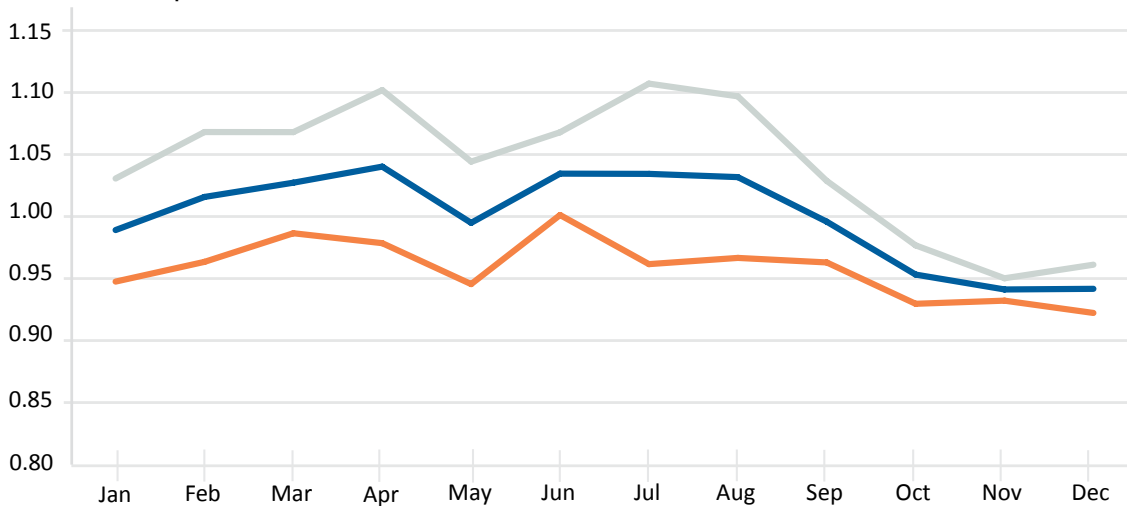## 800- to 900-pound feeder steers

Figure A8. Seasonal price indices for 800- to 900-pound feeder steers in the Pacific Northwest, 2008–12.

Table A8. Seasonal price indices for 800- to 900-pound feeder steers in the Pacific Northwest, 2008–12.

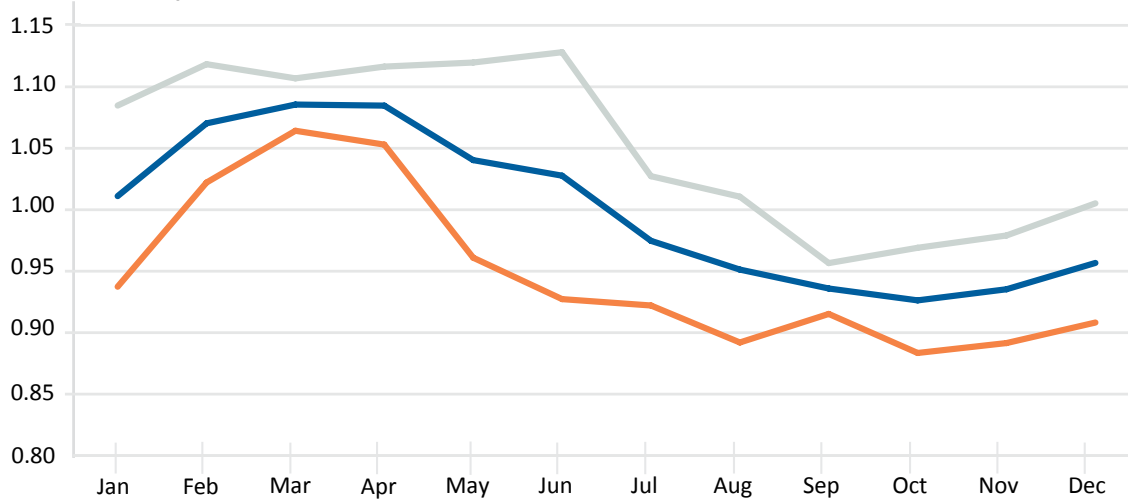|	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	0.989	1.016	1.027	1.040	0.995	1.035	1.034	1.032	0.996	0.953	0.941	0.942
Index + 1 STD	1.031	1.068	1.068	1.102	1.044	1.068	1.107	1.097	1.029	0.977	0.950	0.961
Index - 1 STD	0.948	0.963	0.987	0.979	0.946	1.001	0.962	0.967	0.963	0.930	0.932	0.922

400- to 500-pound feeder heifers

Figure A9. Seasonal price indices for 400- to 500-pound feeder heifers in the Pacific Northwest, 2008–12.

Table A9. Seasonal price indices for 400- to 500-pound feeder heifers in the Pacific Northwest, 2008–12.

	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	1.011	1.070	1.086	1.085	1.040	1.028	0.975	0.951	0.936	0.926	0.935	0.957
Index + 1 STD	1.085	1.118	1.107	1.116	1.120	1.128	1.027	1.011	0.957	0.969	0.979	1.005
Index - 1 STD	0.937	1.022	1.064	1.053	0.961	0.927	0.922	0.892	0.915	0.883	0.892	0.908

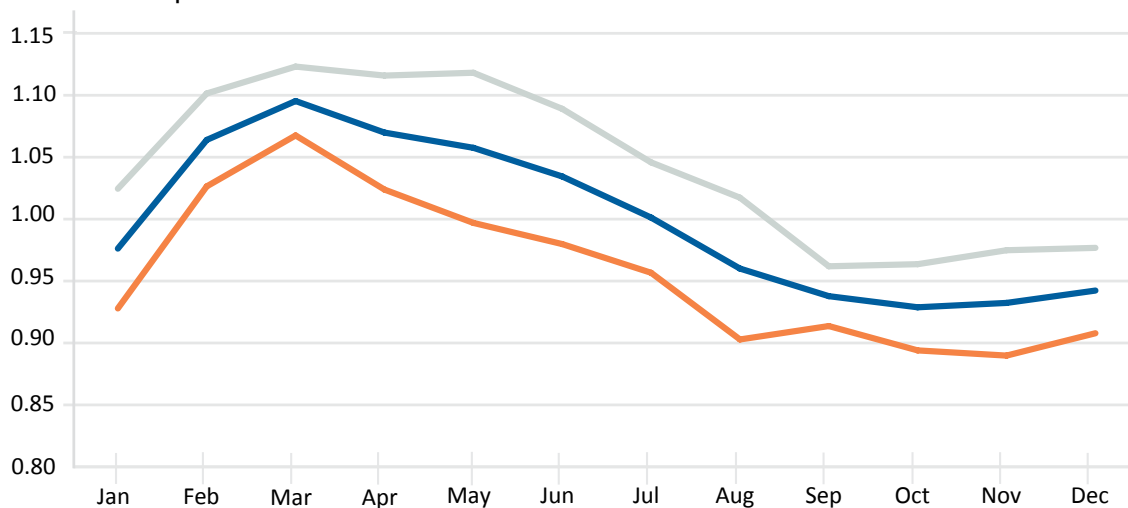## 500- to 600-pound feeder heifers

Figure A10. Seasonal price indices for 500- to 600-pound feeder heifers in the Pacific Northwest, 2008–12.

Table A10. Seasonal price indices for 500- to 600-pound feeder heifers in the Pacific Northwest, 2008–12.

	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	0.976	1.064	1.095	1.070	1.058	1.034	1.001	0.960	0.938	0.929	0.932	0.942
Index + 1 STD	1.025	1.101	1.123	1.116	1.118	1.089	1.046	1.017	0.962	0.964	0.975	0.977
Index - 1 STD	0.928	1.026	1.068	1.024	0.997	0.980	0.957	0.903	0.914	0.894	0.890	0.908

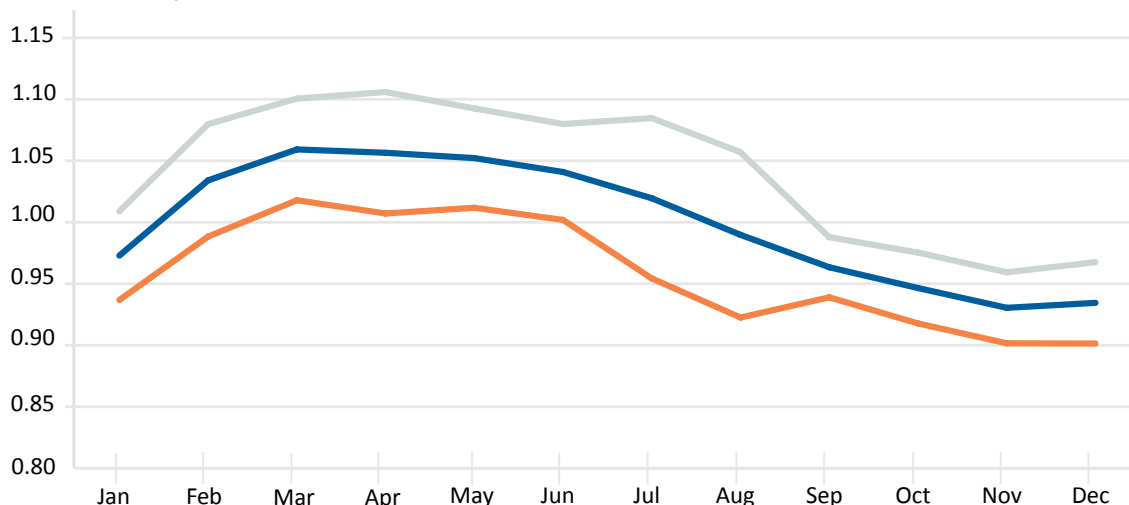## 600- to 700-pound feeder heifers

Figure A11. Seasonal price indices for 600- to 700-pound feeder heifers in the Pacific Northwest, 2008–12.

Table A11. Seasonal price indices for 600- to 700-pound feeder heifers in the Pacific Northwest, 2008–12.

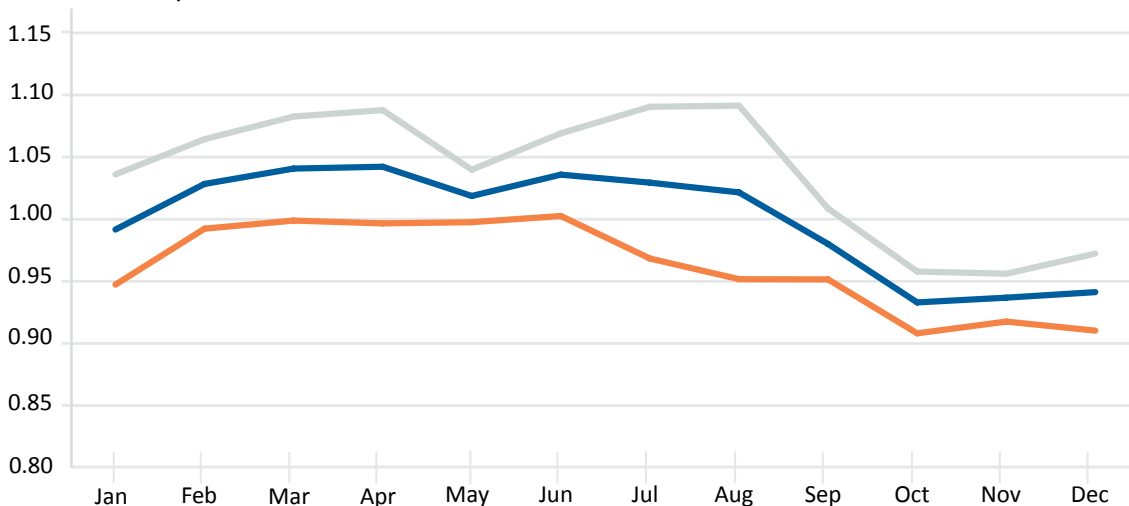|	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	0.973	1.034	1.059	1.057	1.052	1.041	1.020	0.990	0.963	0.947	0.930	0.934
Index + 1 STD	1.009	1.080	1.101	1.106	1.093	1.080	1.085	1.057	0.988	0.975	0.959	0.968
Index - 1 STD	0.937	0.988	1.018	1.007	1.012	1.002	0.954	0.923	0.939	0.918	0.902	0.901

700- to 800-pound feeder heifers

Figure A12. Seasonal price indices for 700- to 800-pound feeder heifers in the Pacific Northwest, 2008–12.

Table A12. Seasonal price indices for 700- to 800-pound feeder heifers in the Pacific Northwest, 2008–12.

	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	0.992	1.028	1.041	1.042	1.019	1.036	1.029	1.022	0.980	0.933	0.937	0.941
Index + 1 STD	1.036	1.064	1.083	1.088	1.040	1.069	1.091	1.091	1.009	0.958	0.956	0.972
Index - 1 STD	0.947	0.992	0.999	0.997	0.998	1.003	0.968	0.952	0.952	0.908	0.918	0.910

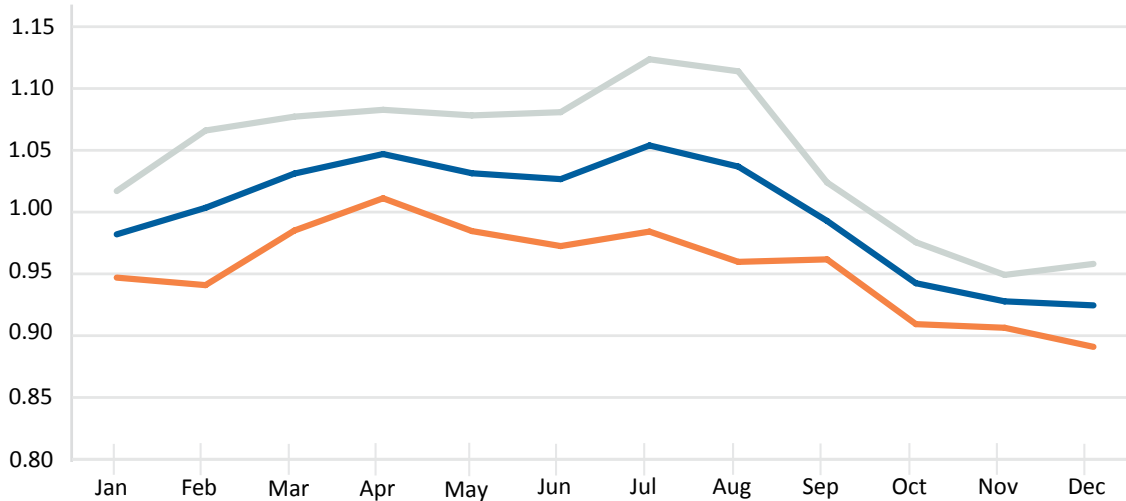## 800- to 900-pound feeder heifers

Figure A13. Seasonal price indices for 800- to 900-pound feeder heifers in the Pacific Northwest, 2008–12.

Table A13. Seasonal price indices for 800- to 900-pound feeder heifers in the Pacific Northwest, 2008–12.

	January	February	March	April	May	June	July	August	September	October	November	December
Price Index	0.982	1.003	1.031	1.047	1.031	1.027	1.054	1.037	0.993	0.942	0.928	0.925
Index + 1 STD	1.017	1.066	1.077	1.083	1.078	1.081	1.124	1.114	1.024	0.976	0.949	0.958
Index - 1 STD	0.947	0.941	0.985	1.011	0.985	0.972	0.984	0.960	0.962	0.909	0.906	0.891

Data sources

Further reading

Managing for Today's Cattle Market and Beyond, a collection of articles, developed by authors with national expertise in the subject area, accessed at http://ag.arizona.edu/arec/wemc/TodaysCattlePub.html

Seasonal & Cyclical Trends, in AGManager.info, accessed at http://www.agmanager.info/livestock/m arketing/bulle-tins_2/management/default.asp

Acknowledgment

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C. Wilson Gray is former District Extension Economist, University of Idaho Twin Falls Research and Extension Center